Quadratic Functions

- *Standard Form of a Polynomial Function*
  - $P(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$
  - Notice: State in Decreasing order of power
- Format of Quadratics/Parabola's
  - Standard Form: $f(x) = ax^2 + bx + c$
  - Vertex Form: $f(x) = a(x - h)^2 + k$

- Axis of Symmetry: A *LINE* that divides the parabola into 2 mirror images $(x = h)$.
- Vertex: *Point* where parabola hits axis of symmetry (h, k).
- Parent quadratic function: $f(x) = x^2$
- Transformations of the parent quadratic
  - Increasing *a*, narrows graph; Decreasing *a*, widens graph
  - *a* positive = up; *a* negative = down
  - *h* shifts graph left and right
  - *k* shifts graph up and down

- For $y = \frac{1}{2}(x - 3)^2 - 5$, what are the vertex, axis of symmetry, minimum or maximum value, domain, and range?

- Information from *Standard* Form of Quadratic
  - Axis of symmetry: $x = \frac{-b}{2a}$
  - Vertex: $\left(\frac{-b}{2a}, f(\frac{-b}{2a})\right)$
- What are the vertex, axis of symmetry, maximum or minimum value, and range of $y = -x^2 + 6x + 3$?

- The arch of the Sidney Harbor Bridge is approximately 500 meters long and 85 meters high. What quadratic function models the curve of the arch? Assume the arch starts at (0, 0).

- How to go from one format to the other
  - $f(x) = ax^2 + bx + c$ TO $f(x) = a(x - h)^2 + k$
    - COMPLETE THE SQUARE!!!
  - $f(x) = a(x - h)^2 + k$ TO $f(x) = ax^2 + bx + c$
    - SQUARE BINOMIAL, DISTRIBUTE *a* TERM, COMBINE LIKE TERMS

- Sketch the graph of $f(x) = 3x^2 - 6x + 4$. Identify the vertex and the axis of the parabola.

- Sketch the graph of $f(x) = -x^2 + 6x - 8$. Identify the vertex and *x*-intercepts.

- Write the standard form of the quadratic function whose graph is a parabola with vertex (-4, 11) and passes through the point (-6, 15).